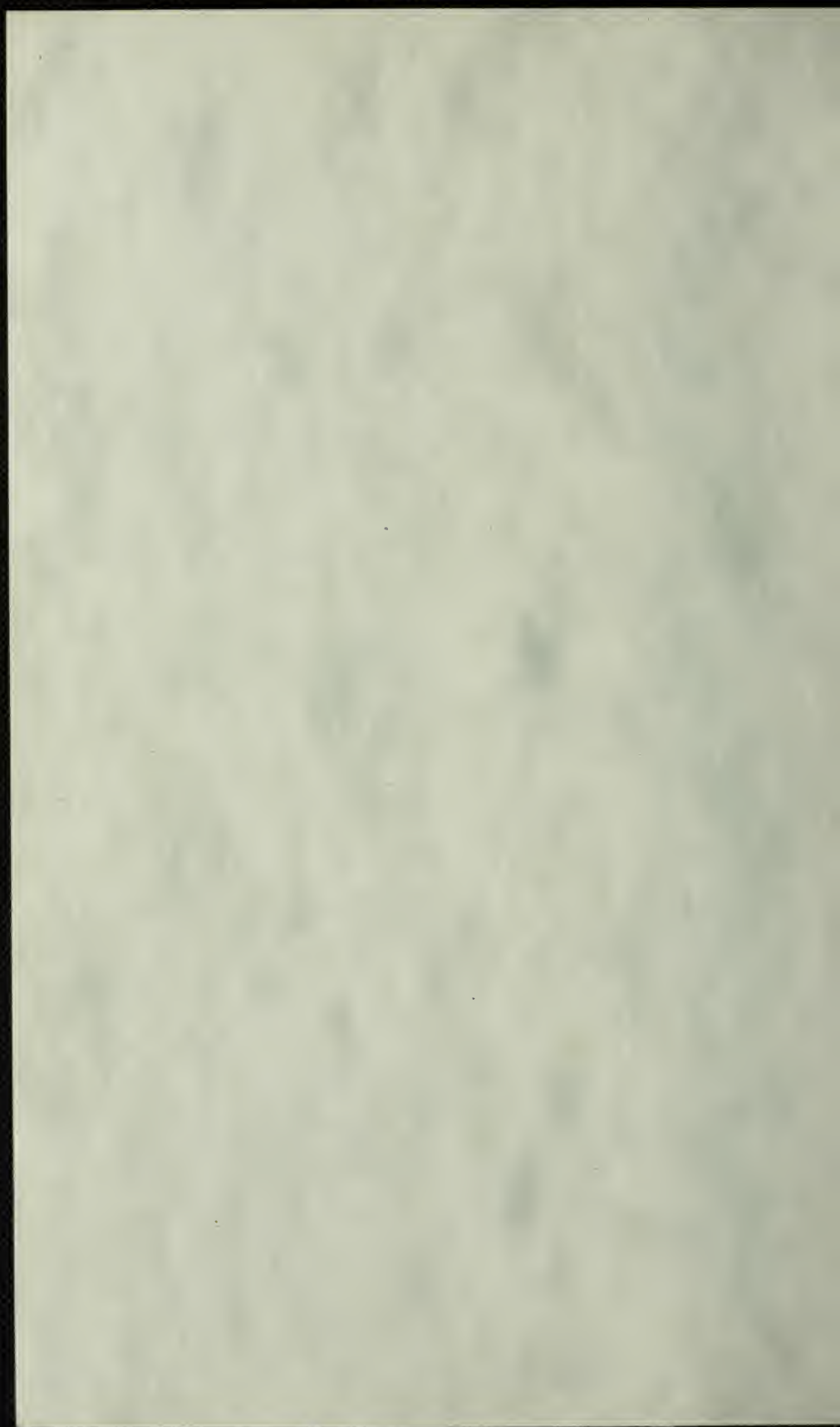


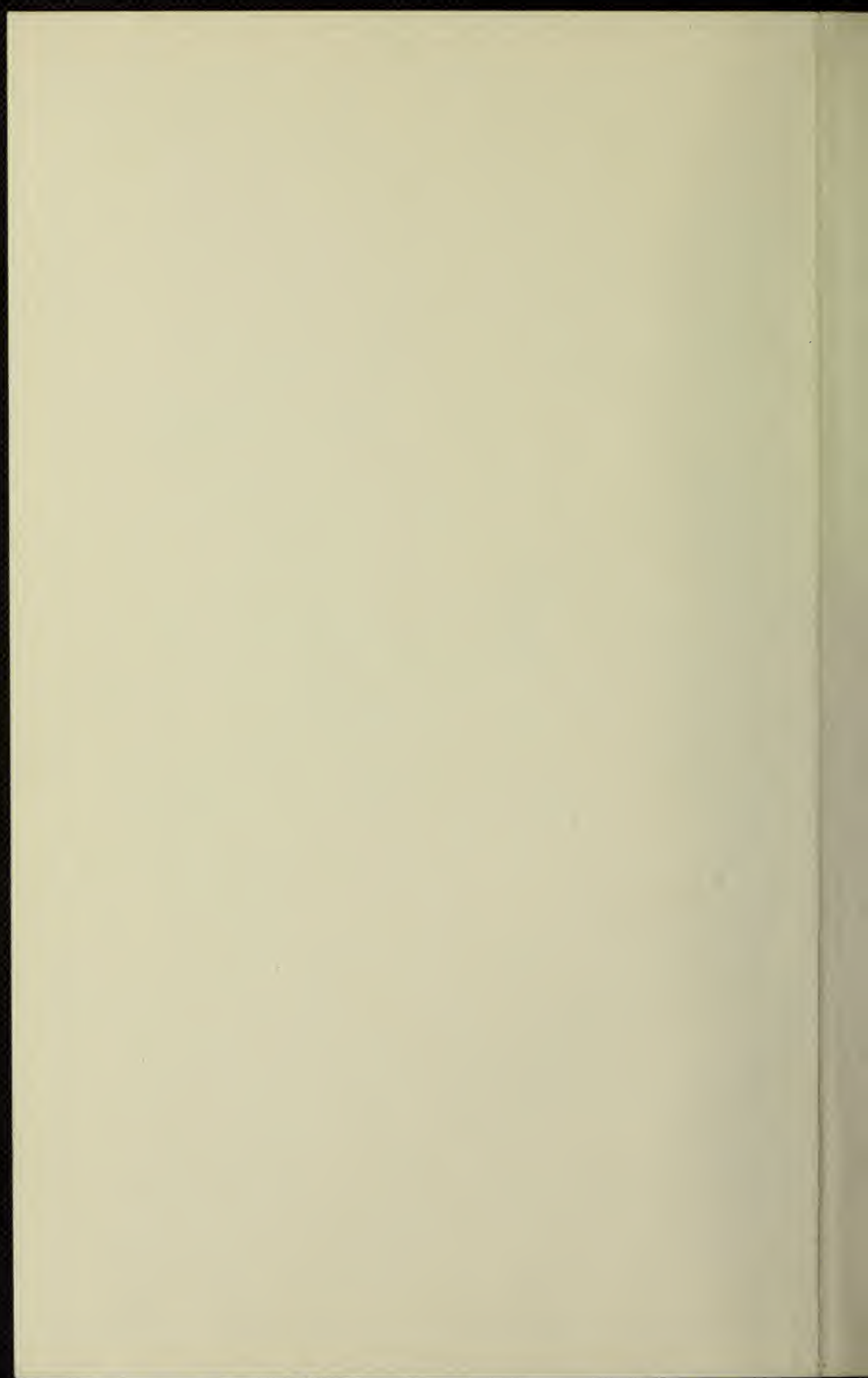
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U. S. -- NATIONAL  
INSTITUTE OF  
HEALTH

ASSOCIATE TRAIN-  
ING PROGRAMS IN  
THE MEDICAL AND  
BIOLOGICAL  
SCIENCES



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# Associate Training Programs in the Medical and Biological Sciences

*at the* NATIONAL INSTITUTES OF HEALTH



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## CURRENT SCHEDULE FOR 1967 ASSOCIATESHIPS

MARCH 1-MAY 7

Application forms and background material available for appointments beginning July 1, 1967

MAY 14

Final date for receipt of completed applications

JUNE 7-25

Interview period (by invitation only)

JULY 8

Notification of selection for appointment

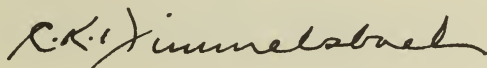
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The National Institutes of Health is a Bureau of the Public Health Service within the U.S. Department of Health, Education, and Welfare. It supports medical research, research training, and construction of research facilities in the Nation's medical and dental

## FOREWORD

schools, universities, and other research centers; and conducts laboratory and clinical research in its own facilities on a 306 acre campus in Bethesda, Maryland, a suburb of Washington, D.C. Here, and in its field facilities, it conducts more than 1,400 research projects at any given time, in its Clinical Center—a single structure housing 516 patient beds and 1,000 laboratories—it cares for an average yearly caseload of about 4,000 research patients. Among its some 1,000 independent investigators and their 2,000 scientifically trained assistants can be found most of the disciplines that contribute to new medical knowledge.

In this scientific community, many opportunities for professional development are available to physicians and others undertaking careers in medical or related research, or in academic medicine. The purpose of this catalog is to set forth in one place succinct descriptions of programs of concern to those interested in Associateships at the NIH.



C. K. HIMMELSBACH, M.D.

*Associate Director, Clinical Center*

*Chief, Clinical and Professional Education.*

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## PART ONE

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# General Characteristics of Associateships

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Unusual opportunities for clinical and professional training at the National Institutes of Health are available to physicians and dentists who are appointed as Clinical, Research, and Staff Associates.

Appointees are commissioned in the Public Health Service, which customarily satisfies Selective Service obligations. Candidates usually apply for such appointments during their senior year in medical or dental school, or during internship. Selections are made 2 or more years in advance and successful candidates are nominated for Selective Service deferment under the Public Health Service CORD Program. The residency deferment program, financial rewards, and other benefits gained by the Public Health Service Commissioned Officer are explained in Part Two of this publication.

The specific purpose of these three similar, though operatively different, kinds of Associateships is to offer training concomitant with the provision of clinical and/or research services.

Each Associate is assigned to a preceptor under whose direction he par-

ticipates in a research program. This represents the largest and most important part of his training experience.

The preceptors are staff members who will give generously of their time to help the Associate—not only in relation to research problems under investigation, but in any way they can to enrich the experience of the Associate during his stay at NIH. The levels of research responsibility and latitude given to an Associate depend upon his training and experience as well as his interests and initiative.

Separate didactic exercises are designed to complement Clinical and Research Associateships, but Associates in all three categories are welcome to attend any of the exercises which can accommodate them if their schedules permit. In addition, accredited postgraduate instruction is available through evening courses offered by the Foundation for Advanced Education in the Sciences, Inc. (see Part Four) ; and Associates in many program areas are expected to take advantage of this academic opportunity.

Associateship appointments are made for 2 years except in the National Institute of Allergy and Infectious Diseases where Clinical Associates are appointed for 3-year periods. In certain Institutes, appointments may be extended for an additional year. Unless he seeks transfer to another area of the Public Health Service, an Associate may expect to be inactivated as an officer at the completion of his Associateship appointment.

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## THE CLINICAL ASSOCIATE

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The Clinical Associate participates in both clinical and laboratory research. Institute programs differ in the proportion of time devoted to laboratory and clinical responsibilities. However, it is a fair estimate that one-half to two-thirds of the Associate's time will be devoted to laboratory research, the remainder being devoted to clinical care of research patients.

Ward activities are under immediate supervision of competent clinical investigators and include a wide variety of rounds, conferences, and other instructive exercises. Proximity to the patient's bedside of collaborating scientists from many biological disciplines has created an unusual opportunity for clinical investigation at the NIH Clinical Center.

The great majority of Clinical Associates are not in formal residency training programs, even though they may be performing many of the same functions that residents do in other hospitals. Some Associates appointed to Dermatology, Neurology, and Psychiatry programs are recommended for a limited amount of residency credit by their respective Program Chiefs; and Associates in Internal Medicine who remain at NIH for a third year may receive credit for this year upon application to the American Board of Internal Medicine.

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## THE RESEARCH ASSOCIATE

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The Research Associate devotes the larger portion of his time to laboratory research in the biomedical sciences; and no clinical responsibilities are involved.

His preceptor is responsible for training him in research methodology and design, and for guiding him in the conduct of specific research undertakings and in the interpretation of results. A real effort is made to select research problems which will enable the Associate to gain breadth and perspective, encounter a variety of laboratory problems, and learn many different approaches rather than become a specialist in one or two refined techniques.

In addition, the Research Associate participates in a series of formal tutorial seminars and informal discussion groups designed in content and emphasis for prospective independent investigators. As described later (see Part Two, Seminars), these discussions are arranged in four divisions, each of which deals with one of the major subdivisions of research in the life sciences. The Associate joins the division of his choice, although he may participate in seminars in various divisions.





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## THE STAFF ASSOCIATE

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The Staff Associate generally has defined his career goal at the time of his appointment; and his work at NIH answers a specific full-time need in an aspect of research which serves to perfect definite skills he wishes to develop under the preceptorship of a senior investigator.

The Staff Associate may participate in either clinical or laboratory research, or both. And although his appointment is not characterized by a formal program of required didactic exercises, when circumstances permit he may broaden his research assignment by attendance at those seminars and conferences in which he has an interest.







## PART TWO

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# Applying for an Associateship

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Approximately 60 Clinical Associates, 40 Research Associates, and 20 Staff Associates are appointed annually.

To consider an applicant for one, two, or all three kinds of appointments, the National Institutes of Health must have received the following forms properly executed no later than the deadline specified on the inside front cover of this booklet:

- Information Record for Clinical, Research, and Staff Associate positions;
- Program Area Selection Check List;
- Application for Appointment as a Commissioned Officer in the U.S. Public Health Service (2 copies) ;
- Fingerprint chart (fingerprints may be obtained at PHS facilities or through a local police or post office) ;
- Professional references from three separate sources (i.e., three sets of references, each set consisting of 1—Request for evaluation and 2—

Statement regarding applicant for a commission in the U.S. Public Health Service);

- Two copies of academic transcripts (showing class standing, if available). The applicant is responsible for requesting the references as well as the transcripts; *and all of the forms listed above must be submitted directly to the Chief of Clinical and Professional Education, National Institutes of Health, Bethesda, Md., 20014.*

It should be noted that a candidate's application for a commission in the Public Health Service does not commit him to accept a commission in the event he is not selected for an Associate position at NIH. However, there are many splendid alternate opportunities for physicians in the Public Health Service which may appeal to such a candidate, and this commission application would be useable for such appointments.

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## ELIGIBILITY REQUIREMENTS

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To qualify for these appointments, an applicant must:

- Be a citizen of the United States;
  - Meet the physical standards of the Public Health Service (A physical examination is given at a PHS facility);
  - Pass an objective multiple choice examination administered by the PHS and covering the general field of medicine; and
  - Before entering on duty, he shall have completed his internship and, in most cases, a year or more of assistant residency. (The amount of training required beyond internship is determined by the specific program areas to which applicants may seek appointment; Part Three of this publication explains any specific residency requirements which must be met.)
- In addition, to be considered for participation in the Commissioned Officer Residency Deferment Program, an applicant must:
- Be a graduate of a medical school approved by the Council on Medical Education and Hospitals of the American Medical Association.
  - Be liable for 2 years of service under the general provisions of the Universal Military Training and Service Act.

Individuals holding reserve commissions or currently deferred by one of the armed services under the Berry Plan cannot be considered for Associate appointments.

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## COMMISSIONED OFFICER RESIDENCY DEFERMENT PROGRAM

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The Commissioned Officer Residency Deferment Program (CORD), developed and conducted by the U.S. Public Health Service with the cooperation of the Selective Service System, permits a limited number of draft-eligible

physicians (1) to become Inactive Reserve officers in the Commissioned Corps of the Public Health Service and (2) to complete 1 or more years of formal residency training before serving on active duty.

In this program, selected physicians who are obligated for 2 years of military service under the general provisions of the Universal Military Training and Service Act are deferred by the Director of the Selective Service System for residency training in specialties that are pertinent to the projected requirements of the Public Health Service.

CORD Program participants are appointed commissioned officers in the Inactive Reserve of the Public Health Service. They do not receive pay from the Service until called to active duty. The stipend normally paid by the hospital to residents may be accepted by CORD Program officers.

When residency training is completed and/or deferment is terminated, the CORD Program officer is obligated to serve on active duty with the Public Health Service for a period of at least 24 months. This period of service will satisfy Selective Service obligations and no further service is required.

It should be noted that, even though tentatively selected for the CORD Program, an applicant cannot participate unless also found fully qualified for appointment as a commissioned officer.

The questions most frequently asked by CORD Program applicants and participants are answered below:

Q As a CORD participant, may I be deferred for a research fellowship?

A No. Deferment may not be recommended for periods of basic science or other graduate training unless the academic training is an integral part of a clinical residency program.

Q For what rank am I eligible?

A If you enter the CORD Program immediately following internship, you will be appointed in the grade of senior assistant surgeon (Inactive Reserve), which is equivalent to lieutenant in the Navy. When called to active duty, you receive a promotion to the grade of surgeon (Reserve), which is equivalent to Lieutenant Commander in the Navy.

Q I was selected for the CORD Program and residency training in psychiatry but have now decided I wish to train in pediatrics. May I change my specialty?

A No. Changes in specialty are not permitted after selections are made.

Q Is there an age limit for the CORD Program?

A Yes. You must complete CORD Program participation and begin active duty before age 32.

Q Is it possible to withdraw from the program prior to actual deferment?

A Yes. You may withdraw your CORD Program application at any time prior to appointment as a commissioned officer; or, if you have already



been appointed, you may resign the commission. The Selective Service will be notified of your withdrawal or resignation.

Q. Is it possible to withdraw from the program while pursuing residency training as a CORD Program officer?

A. Yes. You may request active duty in the Public Health Service.

Q. What happens if I am not found qualified for a commission?

A. If you are not found qualified for a commission, you cannot participate in the CORD Program, and you will be so notified as soon as the determination is made.

Q. If my application for the NIH Associate Program is not approved, may I be considered for deferment under some other PHS activity?

A. Yes. If you apply and are not accepted for an NIH Associate assignment, you may elect (1) to withdraw your application for the CORD Program, or (2) to be considered for residency deferment under the CORD Program and subsequent active duty in one of the other activities of the Public Health Service.

Q. Are participants in the Senior Medical Student Program of the Army (or other service) eligible for the CORD Program?

A. No.

Q. As an intern in a USPHS hospital (or other uniformed service hospital), am I eligible for the CORD Program?

A. If you are interning as a commissioned officer on active duty in the Army, Navy, Air Force, or Public Health Service, you are not eligible to participate in the CORD Program.

Q. I wish to continue my residency training and have applied for the CORD Program. Will the induction notice I recently received from my local Selective Service board alter my status as a CORD Program applicant?

A. Yes. You are no longer eligible for CORD Program consideration, unless the induction notice is canceled. "Postponement of induction" will not reestablish your eligibility.

Q. I have received notification of selection for CORD Program participation and deferment beginning July 1, 1966. Is it possible for my deferment to begin on February 1?

A. No. Deferment before July 1 cannot be arranged.

Q. May I change hospitals while participating in the CORD Program?

A. Yes, provided the new program is approved by the Council on Medical Education and Hospitals of the American Medical Association, all the training is fully creditable by your specialty board, and you notify the public Health Service Office of Personnel.

A pamphlet giving more details about the CORD Program is available on request.



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## METHOD OF SELECTION—MATCHING PROGRAM

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Appointments are based upon intellectual attainment and demonstrated research interest and ability. A man's background in research is often a decisive factor in making selections. This applies more significantly in certain areas—such as internal medicine and psychiatry—than in others—such as surgery and radiation therapy.

All applications are carefully considered; but, in all fairness, it should be understood that successful candidates have outstanding records in medical school, and their references indicate that they have exceptional research training and/or potential.

Associates are selected by a system of matching the candidates' program-area preferences against nominations made by the institutes (similar to NIMP, Inc.). This matching procedure is utilized in selecting all Associates except Staff Associates in anesthesiology and diagnostic radiology. (See Part Three.)

During the month of May candidates' qualifications are reviewed by the institutes. During a 3-week period in June, specified candidates are invited to NIH for interviews by the institutes. (These interviews must be scheduled by the Chief of Clinical and Professional Education and may *not* be arranged through direct communication with institutes or program chiefs.) Following the interviews, candidates indicate their preferences. These are kept in confidence and are used exclusively for matching against Institute nominations during the first week of July. Successful candidates are notified by telephone within the second week of July and are given an opportunity to accept or reject the positions for which they were matched.



### PART THREE

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## Program Areas for Which Candidates May Apply

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Each of the major NIH components has prepared a description of its program areas for which Associates may seek appointment. Due to diversity of the operations and programs within these major components, the descriptions do not follow a pattern. In effect, however, all of these descriptions are meant to anticipate the questions which applicants may have in selecting the program areas for which they wish to be considered. It should be noted that a candidate is not limited as to the number or kinds of positions for which he may apply.



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## NATIONAL CANCER INSTITUTE

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Director, Kenneth M. Endicott, M.D.

Associate Director for Program Planning, Carl G. Baker, M.D.

Associate Director for Grants and Training, Ralph G. Meader, Ph. D.

Associate Director for Field Studies, Paul Kotin, M.D.

Associate Director for Collaborative Research, T. Phillip Waalkes, M.D.,  
Ph. D.

Director of Intramural Research, C. Gordon Zubrod, M.D.

Associate Scientific Director for Laboratory Research, C. Gordon Zubrod,  
M.D.

Clinical Director, Nathaniel I. Berlin, M.D., Ph. D.

Associate Scientific Director for Viral Oncology, W. Ray Bryan, Ph. D.

Associate Scientific Director for Experimental Therapeutics, David P.  
Rall, M.D., Ph. D.

The National Cancer Institute conducts research and provides training in its own laboratories and branches, directs research carried out under contract with other laboratories, and provides grant support of research and training in non-Federal institutions.

It is in the area of intramural research that the majority of institute opportunities exist for clinical and professional education. Research projects directed toward recognition of the causes of cancer, and development of methods for preventing or controlling the disease engage the attention of scientists representing many disciplines. A number of studies cut across clinical and nonclinical lines, but all are placed for administrative purposes in four groups: Basic laboratory research, viral oncology, clinical work, and experimental therapeutics.

Dr. C. Gordon Zubrod, Director of Intramural Research, also acts as Associate Scientific Director for Laboratory Research. Under his general direction, basic studies are carried out in Laboratories of biochemistry, biology, physiology, and pathology and in the Pathologic Anatomy Branch.

In the laboratory of biochemistry research seeks to describe the neoplastic transformation in chemical and molecular terms so as to provide a basis for research at the clinical level. Cellular energy metabolism is studied with special emphasis on the enzymatic mechanisms involved in the origin, development, diagnosis, and chemotherapy of malignant tissues. The relationship between the chemical and physical structure of nucleic acids and proteins and their biological function is also being emphasized.

Carcinogenesis is studied in the laboratory of biology in the broad biologic sense with the malignant transformation of the cell receiving major consideration. Since the role of the thymus in health and disease is a problem of major concern, the effect of thymectomy in the newborn laboratory animal is being studied for clues to carcinogenesis. Research in cytogenetics is emphasizing the effect of specific known genes on the occurrence of animal tumors.



The physiological and chemical properties of the growing tumor and its impact on the host are studied in the laboratory of physiology. Attempts are made to learn how a tumor grows autonomously and how to interfere with this growth. The effects of lethal and sublethal doses of x-radiation on cells *in vivo* and *in vitro* are being studied in order to arrive at a better understanding of the mechanism of radiation damage.

In the laboratory of pathology and the Pathologic Anatomy Branch, normal and malignant tissues are examined and compared. The spontaneous development of cancer in untreated laboratory animals is observed in order to arrive at a better understanding of the basic biologic nature of the disease. In connection with the biopsy and autopsy service of the National Institutes of Health Clinical Center, the laboratory of pathology and the Pathologic Anatomy Branch offer residency training in pathology.

Dr. W. Ray Bryan, Associate Scientific Director for Viral Oncology and Chief of the Laboratory of Viral Oncology directs a program of virus-cancer studies. These are carried out in his laboratory and in the laboratory of viral carcinogenesis. Investigators represent a wide spectrum of scientific disciplines. Their research activities range from the subcellular level to that of the intact animal host, including man. Scientists of both laboratories also participate with non-Federal investigators in collaborative multidisciplinary studies on animal tumor viruses and in the search for viruses in human cancer.

Research emphasizing chemotherapy and related pharmacologic studies is under the direction of Dr. David P. Rall, Associate Scientific Director for Experimental Therapeutics and Chief of the Laboratory of Chemical Pharmacology. Scientists in the Medicine Branch and in the laboratory of chemical pharmacology participate in the selection and evaluation of new agents developed through the national cancer chemotherapy program administered by the Institute. In addition, they carry out important research programs relating to white blood cell and platelet transfusions in treating leukemia, the biochemistry and physiology of normal and malignant white blood cells, cytogenetics, and the effects of neoplastic disease and various antitumor agents on the immune response. Treatment of the leukemias and lymphomas is of major importance.

All other clinical research is under the supervision of Dr. Nathaniel I. Berlin, Clinical Director. This includes investigations carried out in the Dermatology, Diagnostic Research, Endocrinology, Immunology, Radiation, and Surgery Branches.

In the Dermatology Branch, studies are designed to identify and characterize the biologic behavior patterns of the epidermis and related epithelial tissues in normal and pathologic circumstances. These studies seek to determine factors that can alter or establish a specific pattern of response of the epithelial cell.



Research designed to improve methods for early diagnosis of human cancer is currently focused on urinary tract neoplasms, and circulating tumor cells. This program is being developed in the diagnostic research branch.

In the Endocrinology Branch, the role of the endocrine system in the causation, development, and treatment of cancer is under intensive study in patients with tumors arising in either hormone-producing or hormone-sensitive organs. Related research is carried out in the laboratory.

In the Immunology Branch, physiochemical, tissue culture and *in vivo* turnover technics are used in research on the structure, biosynthesis and genetic control of the immunoglobulins. Cellular antigenicity and anti-cell antibodies are being studied in connection with homotransplantation and tumor investigations in man and animals. Immunochemical and cytologic technics are used in studies of complement and mechanisms of cell damage.

A clinical research program emphasizing new techniques in radiotherapy and combined approaches with surgery and chemotherapy is being developed by the Radiation Branch. The first studies are focusing on Hodgkin's disease, mycosis fungoides, and malignant tumors of bone and urinary bladder.

Of major interest to Institute surgeons is control, through surgery, of pelvic malignancies, tumors of the head and neck area, skin, bone, and soft tissue tumors, and tumors of the urogenital system. Studies of patients with such malignancies are concentrated in four major areas: Primary surgical therapy, various aspects of the host response to cancer, factors asso-



ciated with the dissemination of cancer, and urological manifestations of a number of disease entities.

In the Metabolism Service, Institute scientists are studying the metabolism of tumors and the effects of tumors upon the metabolism of their hosts. To achieve these objectives, the research program includes studies of the anemia of cancer, porphyrin and bile pigment metabolism, nucleic acid metabolism, and the rate of protein synthesis in patients.

In the collaborative research area, clinical and preclinical activities of the Institute's nationwide chemotherapy program are under the supervision of Dr. T. Phillip Waalkes.

The Clinical Branch in this area is active in the organization and evaluation of cooperative studies designed to investigate various modalities of cancer therapy. Funds are provided through grants and contracts to support cooperative group studies of all types of human malignancies.

A multidisciplinary approach to the fundamental and developmental aspects of tumor chemotherapy is carried out in the Drug Evaluation Branch of the Cancer Chemotherapy National Service Center which operates the preclinical segment of the national chemotherapy program. An important area of interest is the study of host-tumor relationships in tumor chemotherapy.

In the field studies area, a major responsibility of scientists under the direction of Dr. Paul Kotin is planning and implementing programmed research to improve understanding of cancer causation and the patterns of cancer occurrence. This is accomplished through statistical studies of the natural history of cancer in man and animals and through laboratory experimentation. A special program to provide resource needs of cancer virologists, such as standardized cell lines and new varieties of research animals, is located in the Virology Research Resources Branch of the Field Studies Area.

The Epidemiology Branch plans and conducts studies using data from existing sources such as vital and employment records and clinical observations. These investigations seek clues to cancer causation through analysis of interrelationships in the human and domestic animal populations with respect to their total environment and inheritance.

Some of the biostatistical studies carried out by the Biometry Branch are also concerned with the causes of cancer. Others are devoted to evaluating methods for diagnosing and treating cancer. In this connection, more than 100 hospitals in the United States are cooperating in a patient registration and followup program.

Carcinogenic hazards in man's environment are of special concern to investigators in the Carcinogenesis Studies Branch of the Field Studies Area. Emphasis here is placed on the interaction of host factors with multiple environmental factors.



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## NATIONAL HEART INSTITUTE

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Robert W. Berliner, Director of Intramural Research

Donald S. Fredrickson, Clinical Director

### Associate Program in Medicine and Basic Science

The National Heart Institute currently appoints nine Associates for a 2-year period beginning each July 1. Three of these positions are as Research Associates and six as Clinical Associates. For those who are interested in lengthening their period of research experience, the appointment may, by mutual agreement, usually be extended for a third year.

**GENERAL.** Candidates may apply for one or both types of Associate positions. In selection of Associates preference is given to candidates who intend to devote a significant portion of their career to research. Because of the diversity of the Heart Institute program, special interest in cardiovascular disease is not an essential requirement.

The Associate is free to choose his own area of research assignment. After his appointment in the Heart Institute and prior to his entering on duty, he will make a separate visit to select the laboratory in which he will work. The choice is based on the background and interests of the Associate and is contingent only on the ability of the particular laboratory to furnish proper supervision and facilities. (On the basis of past experience, it would appear virtually certain that each Associate will be able to work with the group of his choice.) The level of research responsibility and freedom will depend upon his training and experience as well as his desires.

**RESEARCH ASSOCIATES.** These appointments are designed to give physicians an opportunity to improve their background for a career in basic medical research. Usually physicians enter the appointment after completing internship and one year residency, but there are no specific requirements for postgraduate training after the M.D. degree.

Each Research Associate will devote his time to research in the laboratory under the immediate supervision of a preceptor in an area of his selection. Each will select appropriate courses in the basic, medical and allied sciences, and seminar and journal club exercises common to the program arranged for Research Associates of all the Institutes. No clinical assignments are involved, but the Associates are welcome to attend any of the clinical teaching exercises.

**CLINICAL ASSOCIATES.** These appointments are designed to give physicians training in both clinical and basic research. Candidates must have completed a minimum of 1 year of internship plus 1 year of residency in internal medicine by the starting date of their appointment.

Clinical Associates will be responsible, under the guidance of investigators on the Heart Institute staff, for the medical care of patients during 10 of the first 14 months of their service. During this time they will rotate

through the four medical services of the Heart Institute, which occupy 85 beds. These services include: (1) Cardiology—clinical studies of physiology and pharmacology of the heart; development and application of diagnostic techniques for evaluation of cardiac lesions; selection and pre-operative evaluation of candidates for cardiac surgery; (2) Clinical Endocrinology—metabolic and endocrine problems, including regulation of aldosterone secretion, relationship of steroid structure to activity, calcium and phosphorus metabolism, and application of metabolic balance techniques; (3) Experimental Therapeutics—origin and treatment of hypertension, cardiac arrhythmias, secreting tumors (carcinoid, pheochromocytoma), collagen metabolism, and the biological activities of vasoactive amines; (4) Metabolism, Kidney, and Electrolytes—disorders of lipid metabolism or due to molecular abnormalities of proteins; studies of renal function and action of diuretics.

The clinical period is one of intensive training under direction of the Clinical Director and staff. It offers exposure to case material of an extraordinary range and to highly sophisticated approaches to investigation of disease.

The Clinical Associate devotes both his time off the wards and a full 14 months of his 2-year assignment to laboratory research under direction of a preceptor *in any one of the Heart Institute laboratories, either clinical or nonclinical*. No clinical responsibilities are required during the optional third year. The Associate may also participate in some of the seminars and instruction available to the Research Associate.

The major form of didactic postgraduate instruction is through the night





courses offered by the NIH graduate school. Both Research and Clinical Associates are expected to take advantage of this academic work.

The laboratories and sections of the National Heart Institute, all of which are open to Clinical and Research Associates for their research work, are listed below with the names of their chiefs. Candidates desiring further information may obtain a current bibliography summarizing the activities of the current staff by writing to Dr. Robert W. Berliner, Director of Intramural Research, National Heart Institute, Bethesda, Md., 20014.

Laboratory of Biochemistry—Chief, Dr. Earl R. Stadtman

Section on Cellular Physiology—Head, Dr. Wayne Kielley

Section on Enzymes—Head, Dr. Earl R. Stadtman

Laboratory of Cardiovascular Physiology—Chief, Dr. Stanley Sarnoff

Laboratory of Chemical Pharmacology—Chief, Dr. Bernard B. Brodie

Section on Biochemistry of Drug Action—Head, Dr. Lewis Schanker

Section on Clinical Pharmacology—Head, Dr. Erminio Costa

Section on Enzyme Drug Interaction—Head, Dr. James R. Gillette

Section on Organic Chemistry—Head, Dr. Elwood O. Titus

Section on Physiology—Head, Dr. Harriet M. Maling

Laboratory of Clinical Biochemistry—Chief, Dr. Sidney Udenfriend

Section on Biochemical Genetics—Head, Dr. Marshall Nirenberg

Section on Enzymes and Metabolism—Head, Dr. H. H. Weissbach

Section on Physiological Chemistry—Head, Dr. Sidney Udenfriend

Laboratory of Kidney and Electrolyte Metabolism—Chief, Dr. Jack Orloff

Section on Experimental Cardiovascular Disease—Head, Dr. James Davis

Section on Membrane Physiology—Head, Dr. Joseph Hoffman

Section on Renal Mechanisms—Head, Dr. Robert W. Berliner

Laboratory of Metabolism—Chief, Dr. Daniel Steinberg

Section on Chemistry—Head, Dr. Henry Fales

Section on Lipid Metabolism—Head, Dr. Daniel Steinberg

Section on Molecular Disease—Head, Dr. Donald Fredrickson

Laboratory of Technical Development—Chief, Dr. Robert Bowman

Cardiology Branch—Chief, Dr. Eugene Braunwald

Section on Cardiovascular Diagnosis—Head, Dr. John Ross

Section on Clinical Biophysics—Head, Dr. Donald Fry

Section on Clinical Physiology—Head, Dr. Eugene Braunwald

Clinical Endocrinology Branch—Chief, Dr. Frederic Bartter

Experimental Therapeutics Branch—Chief, Dr. Albert Sjoerdsma

Gerontology Branch—Chief, Dr. Nathan W. Shock

Surgery Branch—Chief, Dr. Andrew G. Morrow

### Associate Program in Surgery

The Surgery Branch of the National Heart Institute appoints approximately five Associates in Surgery for a 2-year period beginning each July 1. The program is primarily designed for young surgeons with primary interests in cardiovascular surgery and cardiovascular physiology. In making ap-

pointments, preference will be given to candidates contemplating a career in a research or academic atmosphere. Candidates must have completed an internship and at least 1 year of surgical residence by the starting date of their appointment.

Approximately 1 year is devoted to an intensive clinical experience involving the management of patients undergoing operations for congenital and acquired heart disease. During this period the majority of associates are also trained in the techniques of cardiac catheterization and angiography and in the interpretation of clinical physiologic data. A period of approximately 1 year is also devoted to research in the experimental surgery laboratory and in clinical investigations related to operative procedures. This work, carried out in association with staff members, will be in the general field of cardiovascular physiology as applied to the treatment of surgical patients.

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## NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

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Leon Jacobs, Ph. D., Acting Scientific Director  
Vernon Knight, M.D.,  
Clinical Director

Following are brief descriptions of the principal research programs of each of the NIAID units to which Associate appointments will be made.

THE LABORATORY OF CLINICAL INVESTIGATIONS (Vernon Knight, M.D., Chief) conducts studies of viral infections, systemic fungal diseases, nephrosis, systemic lupus erythematosus, familial Mediterranean fever, malaria, leprosy and miscellaneous immunological disorders. In addition, studies are conducted on mechanisms of fever, allotopy in mice, and immunological response to allergens, penicillin and infectious diseases.

The clinical facilities of the Institute are an important feature of the Clinical Associate program. The clinical care program of NIAID consists of 60 hospital beds, 24 of which are usually assigned to Federal prisoner volunteers in the viral respiratory diseases program. The remaining beds are assigned to the various sections and units. First-year Clinical Associates (except for pediatricians, Clinical Associates are appointed for 3 years) are assigned principal responsibility for ward medical care, usually requiring about 9 months of their first year. The clinical service has the responsibility to provide consultation on infectious disease problems to the other Institutes.

THE LABORATORY OF INFECTIOUS DISEASES (Robert J. Huebner, M.D., Chief) encompasses a broad program on the basic biology, ecology, and clinical significance of viral, fungal, and bacterial agents.



Current studies of respiratory agents are concerned with evaluation of the importance of various pleuropneumonia-like organisms in human disease, with means of producing vaccines against many of the more important respiratory viruses, and with studies of rhinoviruses.

In recent years the program of this section has broadened to include studies of tumor viruses, particularly the development of approaches to studies of viral etiology of human cancer.

Physiological, biochemical, and immunologic aspects of pathogenic fungi and mycotic diseases are investigated.

Studies in basic bacteriology include: the role of iron in nonspecific immunity and in metabolism; the electron transport system of hydrogen-utilizing autotrophs; the biochemistry of cell walls; composition and synthesis of naturally occurring and synthetic antimicrobial agents; bacterial ultrastructure; and basic studies of streptococci.

THE LABORATORY OF BIOLOGY OF VIRUSES (Karl Habel, M.D., Chief) is interested in animal and human viruses not only as the cause of disease but as identifiable macromolecules replicating in close association with cellular processes. The sequential biochemical reactions of cellular and viral elements during the replication cycle of RNA and DNA viruses are studied. Similar work is also being carried out on tumor viruses in attempts to demonstrate their relationships to cellular elements and functions.

A parallel study to those on viral synthesis seeks the physical and chemical makeup of the purified virus itself, utilizing electron microscopy, ultracentrifugation, and nucleic acid and protein analysis.

Other programs investigate mechanisms of recovery from acute virus infection with a major interest in interferon, and the immunological reactions of animals to new antigens produced in cells transformed by tumor viruses.

THE LABORATORY OF IMMUNOLOGY (Maurice Landy, Ph. D., Chief) is engaged in a broad program of research in immunobiology, immunogenetics, and immunochemistry.

The origin of antibodies to bacterial endotoxin and of "natural antibodies" are being explored. Immunological mechanisms involved in anaphylaxis and other types of immediate allergy, in delayed hypersensitivity and in protection, are investigated, at the cellular and subcellular level. The relation between structure and activity of inhalant antigens is studied. Heritable, antigenically different forms of serum proteins known as allotypes have been identified and are used as genetic markers. Proteins which cross maternal-fetal barriers, and the properties of rabbit antibodies directed against simple haptens are also of special interest.

THE LABORATORY OF GERM-FREE ANIMAL RESEARCH (John E. Tobie, Ph. D., Chief) provides an unusual facility for many studies. Germ-free guinea pigs, rats, chickens, and even inbred strains of mice can be used. Typical projects include fluorescent antibody studies on malaria, host-parasite relations in amebiasis, susceptibility of germ-free rats to bacterial infections, "natural"



antibodies in germfree animals, pathogenesis of allergic thyroiditis and encephalomyelitis, autoimmune disease in mice, the role of the thymus in antibody-production,  $\gamma$ -globulin metabolism and serum  $\gamma$ -globulin levels in germfree animals.

THE LABORATORY OF BACTERIAL DISEASES (Norman B. McCullough, Ph. D., M.D., Chief) conducts studies on brucellosis as a model of intracellular parasitism and chronicity, on antibody synthesis by mammalian cells *in vitro*, and on PPLO (including bacterial L forms). The latter encompass nutritional requirements, comparative physiology, and antigenic relationships, characterization of chemical fractions and toxins and their use as immunizing and test antigens.

THE LABORATORY OF PARASITE CHEMOTHERAPY (G. Robert Coatney, Ph. D., Sc. D., Chief) is concerned with chemotherapy of malaria and schistosomiasis.

The staff at Bethesda studies promising compounds for activity against these infections in chickens and mice. Efforts are under way to determine the mechanisms of action of drugs and of resistance to the known anti-malarial compounds, and to exploit FA techniques in measuring immune response.

Sections located at Chamblee and Atlanta, Ga., carry on studies on the exo-erythrocytic cycle of malaria in the monkey and the effect of drugs on these stages, on passive or active immunization of simian hosts, and on monkey malarias as potential zoonoses in man.

THE LABORATORY OF PARASITIC DISEASES (Paul P. Weinstein, Sc. D., Acting Chief) combines fundamental and applied studies on: The immunology, biology, and fine structure of protozoa and helminths; hemagglutination, fluorescent antibody and other tests for toxoplasmosis, amebiasis, schistosomiasis, trypanosomiasis, and *Angiostrongylus* infections; the chemical composition and metabolism of parasites and the effect of parasitism on the host; energy transfer in vertebrate and invertebrate cells; nutritional, physiologic, and biochemical factors involved in parasite growth *in vivo* and *in vitro*; relation of host nutrition to pathogenesis in parasitic infections and to the effectiveness of chemotherapeutic agents. Also included are: A broad program on the schistosomes of man, including snail biology, transmission dynamics, and control; and laboratory investigations on *Angiostrongylus* and filariids concerning infection of the vectors, migrations in the final host, invasion of abnormal hosts, and immunity.

THE LABORATORY OF TROPICAL VIROLOGY (Ned H. Wiebenga, M.D., Acting Chief) studies the etiology and epidemiology of arboviruses and viral diseases in the Americas. Research interests include development and inventory of viral reagents and vaccines, serological classifications of viruses and strains, pathogenesis of viral infections, and virusvector relationships. Major activity has recently been devoted to studies of hemorrhagic fever in Bolivia. In collaboration with the Middle America Research Unit, the

etiologic agent has been identified and related to a similar but different virus in Argentina.

THE MIDDLE AMERICA RESEARCH UNIT (Karl M. Johnson, M.D., Director) is located in the Panama Canal Zone and is a joint effort of the PHS and the U.S. Army. The Unit is primarily concerned with the etiology and epidemiology of viral diseases in countries of Middle and South America, with emphasis on arboviruses, and with ecology and etiology of selected fungus infections important in the American tropics.

THE ROCKY MOUNTAIN LABORATORY (Herbert G. Stoenner, D.V.M., Director) is located at Hamilton, Mont., and enjoys status as a world center for the study and control of diseases in nature transmitted to man. Its principal interests are the biology of animal and arthropod-borne microbiota including the relationship of agents to arthropods, comparative pathology, the relation of viruses and rickettsia to the evolution of chronic disease, the natural history of indigenous agents transmissible to man, and new methods of arthropod taxonomy. The Laboratory also studies the immunological, chemical, and physical properties of microbial antigens and structure and composition of micro-organisms and the relation of cellular constituents to biologic functions.

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## NATIONAL INSTITUTE OF ARTHRITIS AND METABOLIC DISEASES

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J. E. Rall, M.D., Ph. D., Director of Intramural Research  
Robert S. Gordon, Jr., M.D., Clinical Director

### Clinical Associates

Following are brief descriptions of the principal on-going research programs which will be of interest to Clinical Associate applicants.

IMMUNOLOGICAL ASPECTS OF ARTHRITIS AND CONNECTIVE TISSUE DISEASES (F. Paul Alepa, M.D., Acting)—Derangement in immunological mechanisms as a basis for pathogenesis of rheumatoid arthritis, juvenile rheumatoid arthritis, Sjögren's syndrome, and certain connective tissue diseases is under study. Techniques used are various tests for rheumatoid factor, isolation of these factors, Ouchterlony technique, immunoelectrophoresis and analytical ultracentrifugation.

IMMUNOCHEMISTRY (Henry Metzger, M.D.)—Various problems related to the structure of immune globulins are under investigation. For these studies the techniques of immunology (precipitin analysis, hapten-binding, gel diffusion) and protein chemistry (column chromatography, ultracentrifugation, etc.) are being utilized.

BIOCHEMISTRY OF THYROID HORMONES (Jacob Robbins, M.D., Jan Wolff,



Ph. D., M.D., and staff)—The thyroid section encompasses work in most areas of thyroid biochemistry, ranging from basic disciplines of organic and physical chemistry (e.g., mechanisms of thyroxine synthesis, physical chemistry of thyroglobulin) to more biological areas of interest (e.g., transport of iodide by thyroid cell membrane, biochemistry of natural iodoproteins, metabolism of thyroid cells, proteolytic systems of the thyroid, iodine kinetics). It includes work on selected aspects of thyroid disease.

**STEROID HORMONE METABOLISM, NEUROENDOCRINOLOGY** (Saul W. Rosen, M.D., Ph. D.)—The steroid hormone section encompasses work on gonadal disorders (e.g., hypogonadotrophic hypogonadism), the neuroendocrine regulation of gonadal function (e.g., immunoassay of gonadotrophic hormones), gynecomastia caused by nonovarian steroids.

**DISORDERS OF INTERMEDIARY METABOLISM IN GOUT AND AMINOACIDURIAS** (J. Edwin Seegmiller, M.D.)—The principal interest of this laboratory is the biochemical basis of inherited human diseases in terms of derangements of intermediary metabolism. Also being investigated is the precise mechanism by which the basic biochemical defect produces the clinical pathological state. Possible approaches to therapy of such disorders as gout and cystinosis are being explored.

**INBORN ERRORS AND REGULATION OF METABOLIC PATHWAYS** (Stanton Segal, M.D.)—The metabolic pathways section encompasses work on the regulation of metabolic pathways (e.g., intermediary carbohydrate metabolism in man), inborn errors in metabolic pathways (e.g., galactosemia, cystinuria), and amino acid transport by cells. It also includes work on selected problems concerned with clinical diabetes and hypoglycemia.





**BIOCHEMICAL ASPECTS OF GASTROINTESTINAL TRACT DISORDERS** (Leonard Laster, M.D.)—The primary concern of this group is to correlate facets of the biochemistry, physiology and pathology of organs of the gastrointestinal tract with clinical disease. Major interests include the metabolism and transport functions of the small-intestine mucosa, derangements of these processes in patients with malabsorption due to various diseases, and alterations in organs of the gastrointestinal tract in patients with inborn errors of metabolism. At present efforts are concentrated on the disease homocystinuria which has been shown to be attributable to a deficiency of cystathionine synthetase activity and which can produce, in addition to mental retardation, pathological changes in the liver.

**MINERAL METABOLISM** (Gerald D. Aurbach, M.D., and G. Donald Whedon, M.D.)—Studies in progress are concerned with the chemistry, mechanism of action, and immuno-assay of polypeptide hormones. This work is particularly directed towards the detection and characterization of parathyroid hormone in clinical disorders of parathyroid function and in metabolic bone disease. Clinical metabolic studies involve investigation of patients with various bone disorders (osteoporosis, osteomalacia, hyperparathyroidism, Paget's disease) by means of metabolic balance and bone-seeking radioisotopic studies. Calculation of rates of mineral turnover, deposition and resorption, kinetic analysis of gastrointestinal absorption of mineral, and related *in vitro* bone studies, as affected by a variety of endocrine hormones and by variations in nutritional factors, are providing insight into the mechanism of action of these factors and into the nature of the metabolic derangements in these diseases.



**CLINICAL BIOCHEMISTRY** (Robert S. Gordon, Jr., M.D.)—Selected problems amenable to investigation by clinical, biochemical, and metabolic methods are being studied in normal volunteers and suitable inpatients. Areas of current interest include effects of heat stress on balance of electrolytes, especially potassium, and mechanism of action of certain cathartic drugs.

**CYSTIC FIBROSIS OF THE PANCREAS** (Paul A. di Sant'Agnese, M.D.)—The Pediatric Metabolism Branch is currently devoting its full efforts to the elucidation of some of the complex problems of cystic fibrosis. The abnormally high sweat sodium content in these patients has suggested a primary sweat gland defect or end-organ dysfunction. To elucidate this defect, standard adrenal function tests and specific studies in aldosterone and sweat electrolyte metabolism in these patients are being performed. Laboratory studies are concerned with identifying and characterizing an abnormal constituent (if any) common to all organs and tissues in fibrocystic patients. Similar mucoproteins which seem unusually specific to cystic fibrosis have been found in urinary, duodenal, and salivary secretions. Using immunochemical techniques and routine chemical analyses, the relation of these substances to tissue precursors is being studied. The role of *Pseudomonas mucopolysaccharide* in the production of mucus secretions is also being investigated.

**IMMUNOHEMATOLOGY AND BLOOD COAGULATION** (N. Raphael Shulman, M.D.)—Clinical and laboratory research in the fields of immunohematology and blood coagulation are being conducted. Specialized techniques used are those of protein chemistry (purification and characterization) enzyme chemistry, immunochemistry, complement fixation, and all tests used in clinical and investigative blood coagulation. Topics of clinical investigation are related to laboratory projects. These include immunologic aspects of blood cell deficiency states, problems of "autoimmunity" and homo- and hetero-transplantation, and blood coagulation abnormalities of all types. The branch is responsible for clinical consultation in general hematology throughout the Clinical Center.

### Research Associates

The National Institute of Arthritis and Metabolic Diseases has four positions available each year for Research Associates. These 2-year appointments, usually beginning on July 1, are designed to give highly qualified physicians an opportunity to improve their background for a career in basic medical research. During his stay here, each Research Associate will devote the larger part of his time to participation in laboratory research under the immediate supervision of a preceptor. The Research Associate, approximately 1 year prior to beginning, will visit NIAMD to select the laboratory and

preceptor with whom he wishes to work. Candidates desiring further information about the laboratories, staff and bibliography of NIAMD may obtain this by writing to Dr. J. E. Rall, Director of Intramural Research, NIAMD, National Institutes of Health, Bethesda, Md., 20014.

### Staff Associates

From time to time, Staff Associates will be appointed in NIAMD to work on current problems in specific laboratories. The Section on Intermediary Metabolism (Chief, Dr. Yale Topper), of the Laboratory of Biochemistry and Metabolism, will interview candidates in 1965 for appointment in 1967.

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## NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT

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Donald Harting, M.D., Acting Director

Gilbert L. Woodside, Ph. D., Assistant to the Director for Scientific Programs

This relatively new Institute, with no laboratory or clinical facilities at the NIH Bethesda location at this time, offers Associateships in many different areas; for example, those with a concern for pediatrics, obstetrics, internal medicine, surgery, anesthesiology, embryology, genetics, pharmacology, behavioral science, social science, mental retardation, reproductive physiology, or longitudinal studies relating to any one of the Institute's eight major initial program areas.

Appointments to the eight program areas, brief descriptions of which follow, may be made to clinical (inpatient-outpatient) and laboratory facilities, hospital services, laboratory studies, and epidemiologic investigations located in various parts of the United States. The location of these is specified in instances where final arrangements have already been completed.

**THE REPRODUCTIVE BIOLOGY PROGRAM** (under the acting direction of Gilbert L. Woodside, Ph. D.) seeks through research to improve our understanding of the basic processes whereby life is propagated. Emphasis is being placed on parental factors and the early sequence of events leading from conception through embryonic formation.

**THE PERINATAL BIOLOGY PROGRAM** (under the acting direction of Franz W. Rosa, M.D.) concerns itself with events occurring during the interuterine period of life and their relations to infant survival and later development. Major emphasis will be put on understanding the biology and behavior of the pregnant woman.

**THE GROWTH AND DEVELOPMENT PROGRAM** (under the direction of Dwain N. Walcher, M.D.) primarily concerns itself with the determinants of physical, intellectual, social, and behavioral development in the period



from birth to full maturity. Major emphasis is being given to health problems unique to infancy, childhood, and adolescence.

THE AGING PROGRAM (under the direction of James Birren, Ph. D.) strives to understand the biological, behavioral, and social processes that account for the lessening of vigor and fitness that is experienced in varying degrees with advancing years. This includes the study of the progressive changes that take place in a cell, a tissue, an organ system, a total individual or a group of individuals with the passage of time. Special attention is being given to investigation of the middle years of adult life.

THE MENTAL RETARDATION PROGRAM (under the direction of Gerald D. LaVeck, M.D.) seeks to mount a concerted research attack on the cause, prevention, diagnosis, and treatment of this handicapping condition.

THE CONGENITAL MALFORMATIONS PROGRAM (under the acting direction of Franz W. Rosa, M.D.) supports research into the prenatal causes of structural defects which are present at birth. Emphasis is being placed on multiple organ system defects, their cause, prevention and treatment.

THE DEVELOPMENTAL PHARMACOLOGY PROGRAM (under the acting direction of Sydney Segal, M.D.) supports research into the variation of the effects of drugs and other therapeutic agents at the different stages of life. Emphasis is placed on studying the effects of these agents on various stages of mammalian prenatal life.

THE HUMAN COMMUNICATION PROGRAM (under the direction of Norman F. Gerrie, D.D.S.) studies the complex mechanisms whereby human beings receive information from their environment and then express themselves by means of coordinated interaction of organ systems. Normal development of this complex function which results in language and speech is receiving primary emphasis.

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## NATIONAL INSTITUTE OF DENTAL RESEARCH

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Seymour J. Kreshover, D.D.S., M.D., Ph. D., Associate Director in Charge of Research

Edward J. Driscoll, D.D.S., Clinical Director

Following are brief descriptions of the principal research programs of each of the NIDR units to which Associate appointments are made.

THE LABORATORY OF BIOCHEMISTRY (Frank J. McClure, Ph. D., Chief) includes programs of basic research on proteins, enzymes, and nucleic acids, on biological processes of calcification, protein synthesis, and intermediary metabolism, and on disease processes, including caries and congenital anomalies. These studies are conducted with the techniques, instrumentation, and biological materials used by physical chemists, organic chemists, biochemists, nutritionists, physiologists, and anatomists. The

objectives of this Laboratory are to contribute to an understanding of basic biochemistry for future application to the fundamentals of disease processes and to develop approaches for the prevention and treatment of oral disease.

The Protein Chemistry Section is primarily concerned with the structure and biosynthesis of connective tissue proteins, and also is engaged in studying various aspects of calcification.

The Section on Enzyme Chemistry studies the mechanism of enzyme action, enzyme structure, nucleic acid chemistry, and protein synthesis.

Achievements of the Laboratory include: description of physiological and metabolic effects of fluoride on skeletal and dental tissue; demonstration of the relationship between fluoride and the metabolism of calcium and strontium; descriptions of effects of dietary deficiencies and supplements on dental caries; development of an assay for teratogenic compounds and the application of this method to the study of several drugs; contributions to knowledge of the structures of collagen and elastin; analyses of the structure and mechanism of action of aldolase; separation and analysis of specific components of transfer ribonucleic acids; analysis of the conversion of vitamin B<sub>12</sub> to its coenzyme form.

THE LABORATORY OF MICROBIOLOGY (Henry W. Scherp, Ph. D., Chief) has as its broad objective the elucidation of the microbial ecology of the oral cavity, that is, to understand the interactions of members of the oral microbiota with one another and with the tissues of the host in which they reside, particularly in reference to oral health and disease. Though the Laboratory's programs derive from concern with such diseases as dental caries, periodontal disease, and pathoses of the oral soft tissues, they necessarily include supportive fundamental studies in microbial taxonomy, microbial physiology, immunology, experimental pathology, gnotobiotics, and virology. Cooperative research with other laboratories and branches is conducted as required by the interdisciplinary nature of particular projects.

Current interests of this Laboratory include study of streptococci as specific transmissible agents of caries; specific transmissible periodontal pathosis of hamsters caused by a filamentous organism; immunochemistry and physiological effects of endotoxins from microorganisms implicated in periodontal disease; histolytic enzymes of microorganisms residing in the gingival sulcus; pathogenesis of experimental infections with oral microorganisms in normal and germfree animals; taxonomy of oral actinomycetes, lactobacillis, streptococci, spirochetes, and veillonellae; immunochemical relationships of oral bacteroides, fusobacteria, and leptotrichiae; genetic and dietary influences in experimental caries of rodents; biochemical basis of cellular differentiation in the slime mold, *Dictyostelium discoideum*; intermediary metabolism of carbohydrates by oral lactic-acid bacteria and veillonellae; biosynthesis and function of folic acid; mechanism of cell killing and recurrent infection of herpes simplex virus; serological relationships of herpes simplex virus; pathogenesis of infection with lactic-dehydro-



genase virus; pathogenesis of intraoral ulcerations; allergic reactions of oral mucosa; role of oral microorganisms in formation of dental calculus. THE LABORATORY OF HISTOLOGY AND PATHOLOGY (David B. Scott, D.D.S., Chief) is directed toward three general research areas—physical biology, histochemistry, and experimental pathology. Although there is considerable overlapping in these activities, assignment of the candidate as well as preceptorial guidance will normally fall into one of these subdivisions.

The studies in physical biology are a broad series of projects concerned with normal and pathologic embryology, anatomy and properties of various mineralizing tissues, basic crystal chemistry of calcium phosphates and related compounds, and the morphological characteristics of whole and fractionated tissue cells, microorganisms and viruses. Opportunities for cooperative research and training are offered in electron microscopy and diffraction, contact, and projection microradiography, X-ray diffraction, and infrared absorption spectrophotometry, as well as other standard laboratory techniques.

In histochemistry the investigations are directed primarily to determination of the chemical composition and reactive groups in normal and diseased connective tissues. Standard and experimental histochemical methods, both qualitative and quantitative, are employed, and work is in progress on the development of techniques for similar work at the electron microscopic level.

The activities in experimental pathology are largely limited to investigation of factors influencing the initiation, transmission and inhibition of dental caries and periodontal disease. A wide variety of basic animal experiments are conducted as well as clinical trials, as indicated, of promising therapeutic agents and procedures.

THE EPIDEMIOLOGY AND BIOMETRY BRANCH (Albert L. Russell, D.D.S., M.P.H., Chief) is concerned with the study of the occurrence of oral diseases in population as determined by direct observation and studies in relation to various characteristics of the persons examined, their way of life and the environment in which they live. Field studies are designed and conducted in an effort to identify, within this dynamic complex, variables which influence either favorably or unfavorably the occurrence of disease. The objective of epidemiological study is to provide information that might prove useful in the prevention, control or treatment of disease.

Research activity of the Branch is currently devoted to the epidemiological study of dental caries, periodontal disease and malocclusion. These processes represent by far the three most prevalent problems of oral health. A large scale study of relationships between nutritional status and oral diseases also is in progress.

Investigations conducted by this Branch have contributed to the understanding of oral diseases in the following areas: The fluoride dental caries relationship, including the caries inhibitory effect of fluoridated water; the development of an acceptable and reliable method for assessing the occur-





rence of periodontal disease in populations; the high worldwide prevalence of periodontal disease and an appreciation of the major public health problem created by this disease; the close association between the occurrence of dental plaque, calculus deposits, and periodontal disease; the relationships between nutritional status and oral diseases in various populations.

**THE ORAL PHARYNGEAL DEVELOPMENT PRORGAM** (James F. Bosma, M.D., Chief) is concerned with the development of form and of respiratory and feeding functions in normal and in impaired infants and children. The staff of pediatricians, orthodontists, and speech specialists collaborate in study and therapy of inpatients and outpatients. Study methods are varied, and commonly include standard and cephalometric radiology, cineradiology, cinephotography, and speech recording, and analysis. Particular efforts are made to adapt familiar study techniques and therapies to patients severely handicapped by anomaly or neurological impairment.

Basic investigation is conducted in relevance to clinical problems, including studies of cephalic skeletal growth in a variety of mammals, studies of brain stem mechanisms and motor coordinations of swallow and vocalization.

**THE HUMAN GENETICS BRANCH** (Carl J. Witkop, Jr., D.D.S., Chief) conducts projects in cellular, clinical, and population genetics, with the objective of throwing light on the genetic mechanisms in various diseases and normative processes.

In these studies, a wide variety of approaches are utilized, ranging from basic biochemical, immunochemical, and cytological to mathematical and computer techniques. In addition, clinical skills in both medicine and dentistry are called upon. At the molecular and cellular level, specific studies are concerned with the immune mechanisms, cell growth, biochemical basis of differentiation, cellular handling of genetic information, and chemical characterization and genetic control of salivary constituents. More clinically oriented studies involve such hereditary defects as deafness, renal disease, albinism, defects of enamel and dentin, speech and masticatory abnormalities. Population studies of congenital malformations, inbreeding effects in isolate populations, inherited hemoglobinopathies and blood groups are also in progress.

Recent achievements of the Branch include: The demonstration of a relationship between the inherited ability to taste phenylthiocarbamide and susceptibility to dental caries; an indication of two types of recessive albinism in man with different biochemical bases; clarification of the role of tetracycline administration during odontogenesis as a cause of tooth defects; the finding of genetically determined biochemical defects associated with speech and masticatory disorders; elucidation of genetic and environmental factors in individual differences in salivary constituents; contributions to knowledge of nucleic acid metabolism and mechanisms of mitotic stimulation in normal cells.

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## NATIONAL INSTITUTE OF MENTAL HEALTH

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John C. Eberhart, Ph. D., Associate Director for Intramural Research  
Robert A. Cohen, M.D., Ph. D., Director of Clinical Investigations

This Institute offers an opportunity for post-doctoral research training in psychiatry and in the biological and behavioral sciences. Clinical Associates are assigned clinical and research responsibility with approximately one-half time for each endeavor. Research Associates engage both in laboratory research and in formal tutorial seminars in biochemistry, pharmacology, neurophysiology, and the behavioral sciences under the preceptorship of one of the senior staff. Staff Associates are engaged primarily in laboratory research under the preceptorship of a senior investigator. Staff Associates may secondarily participate in didactic training as laboratory commitments and personal interests may coincide.

Lectures, seminars, and group discussion by members of the staff and by visiting lecturers complement the training program, making it possible for Associates to acquire a broad background in the neural and behavioral sciences with more intensive and individualized study in selected aspects of the field.



It should be noted that clinical experience in the NIMH emphasizes the opportunity to learn to use a ward and its staff for research purposes as well as for treatment. An opportunity is provided to administer a research ward for the treatment of psychotic patients emphasizing community oriented milieu therapy and utilizing various patient and patient-family groups as the major therapeutic instruments.

Descriptions of the NIMH program areas to which Associates will be appointed follow.

**THE ADULT PSYCHIATRY BRANCH** (Lyman C. Wynne, M.D., Ph. D., Chief) conducts a program of research into various aspects of the causes and treatment of mental illness and emotional disturbances. Studies are currently being carried out in the following areas: (1) Family and Twin Studies—patterns of interaction in the families of disturbed adolescents and young adults; comparison of schizophrenic and nonschizophrenic families, especially in terms of thought disorder and cognitive styles; experimental methods of studying family styles of communicating and relating; comparison of schizophrenic and nonschizophrenic siblings and twins within the same family; developmental and cross-cultural aspects of schizophrenia; techniques of family psychotherapy; (2) Personality Functioning and Development—cognitive and attentional mechanisms in relation to anxiety; hospital and field studies of factors that facilitate and impair the development of identity, self-concept, and problem-solving effectiveness in adolescence; neurotic and psychotic reactions on going away to college; sources of effective coping behavior in periods of major transition; cross-cultural aspects of adolescent development; (3) Psychosomatic Medicine—problems in the area of biology and behavior, specifically dealing with endocrine responses in the affective disorders; neurochemical correlates of behavior in experimental animals; and biological factors related to stress which may, in turn, change or alter behavior; (4) Psychophysiology of Sleep—the interrelations of physiological and subjective aspects of sleep and dreaming are being explored with the general goal being that of understanding the possible clinical significance of these functions in psychopathological states.

**THE CHILD RESEARCH BRANCH** (Wells Goodrich, M.D., Chief) conducts a program of correlated research projects on personality development. A longitudinal study of persons living in the community is conducted by an interdisciplinary staff including psychiatrists, psychologists, social workers and teachers with some participation by pediatricians and social scientists. The aim of this program is to explore patterns of adaptation in newborn infants, preschool children, young married couples and young parents. Basic research is carried out on the relationship of infant behavior patterns to congenital factors and on interpersonal behavior in the family as it influences personality: (1) Infant Studies—observations of infants in the first few days of life are carried out in local hospitals. Patterns of behavior believed to indicate enduring traits are followed longitudinally through



observations in a nursery school laboratory; (2) Family Studies—marriage relationships are studied by means of questionnaires, experimental problem solving and interviews. This information is used to characterize communication patterns, ego defenses, and modes of family coping with the early stages of the family life cycle.

THE LABORATORY OF CLINICAL SCIENCE (Seymour S. Kety, M.D., Chief) conducts a program of research in biochemistry, pharmacology, physiology, medicine, and psychiatry and the interrelationships among them. Current research includes: (1) Mechanism of action and metabolism of drugs and hormones which act in the nervous system, especially catecholamines; (2) thyroxine action on protein synthesis; (3) biochemical studies in endocrine and metabolic disorders and in disease of the autonomic nervous system, including metabolism of amino acids, catecholamines, and other biogenic amines; (4) biochemical studies on myelin; autosensitization reactions in the central nervous system; (5) unit activity in cortical and subcortical areas in relation to sleep and attention; (6) cerebral circulation and metabolism; (7) circulatory physiology and psychosomatic medicine; (8) longitudinal investigation of patients stressing interpersonal, physiological, and metabolic parameters that vary with clinical course. In addition to the investigations on physiological and biochemical parameters (including serum proteins, catecholamines, specific enzyme activities, and certain endocrine functions), group process and the dynamics of milieu therapy are studied, as well as the dynamics of family interaction as it relates particularly to psychosis and depression.

THE CLINICAL NEUROPHARMACOLOGY RESEARCH CENTER (Fritz A. Freyhan, M.D., Deputy Chief in Charge of Clinical Studies) is situated in the William A. White Building at Saint Elizabeths Hospital, Washington, D.C., where it is operated as a collaborative program between the National Institute of Mental Health and the hospital. The William A. White Building functions as an autonomous psychiatric research center on the campus of Saint Elizabeths Hospital.

A psychiatric service has been established which includes five admission and one research ward; a day hospital; a clinic; and a home service. It conducts a program in clinical, experimental, and social psychiatry. Current investigations include: (1) Longitudinal studies of patients with personality and psychotic disorders, focusing on psychopathological and psychosocial factors which influence clinical course, treatment response and social functioning; (2) studies of families with multiple incidence of mental illness; (3) studies in clinical psychopharmacology with particular emphasis on methodology of treatment evaluation; (4) comparative evaluations of therapies and of therapeutic settings for patients with functional disorders; and (5) experimental studies of physiological and biochemical factors associated with mental disorders.

Neurochemistry and psychopharmacology investigations include studies on the effects of drugs on the intracellular distribution, binding and release of neurohumors in animal tissue; the regional distribution of neurohumors in the brain; the assay of biogenic amines and their metabolites in body fluids; the intermediate metabolism of phenothiazines; the metabolism of psychoactive tryptamine derivatives; and various problems in the regional pharmacology of the brain.

Neurophysiology investigations include microelectrode and micropipette studies on the effect of drugs applied to single cells in various areas of the brain. Special techniques developed at the center are employed in these investigations.

Supervised facilities for Ph. D. work can be provided by the center subject to sponsorship by universities. The university department concerned must be approved by the laboratory or branch chief.

THE LABORATORY OF NEUROBIOLOGY (Ichiji Tasaki, M.D., Acting Chief) conducts research on a variety of excitable cells and tissues, including the brain, using mainly neuroanatomical, neurophysiological, biophysical, and behavioral techniques. This interdisciplinary brain research program seeks an improved understanding of basic neurobiological mechanisms, including those mechanisms underlying perception, learning, memory, judgment and other complex functions. Specifically studies are carried out on: (1) The physical and biochemical mechanisms underlying electrophysiological events in membranes and synapses; (2) the central controls governing transmission along sensory pathways; and (3) the general principles of integration linking higher sensory and motor pathways in spinal cord, brainstem, and cortex.

THE LABORATORY OF GENERAL AND COMPARATIVE BIOCHEMISTRY (Giulio L. Cantoni, M.D., Chief) conducts investigations on: Mechanisms and pathways of protein biosynthesis; biological methylations; mechanisms of biological oxidations including oxidation reactions; and alkaloid biosynthesis.

The main focus of the laboratory is on the molecular biology of S-RNA including determination of the base sequence of purified S-RNAs, interaction with messenger RNA and ribosomal particles, biological coding, enzymology of S-RNA, physicochemical studies, etc.

The Section on Cellular Regulatory Mechanisms has a broad program on biological oxidation. The enzymes and coenzymes involved in the oxidation of phenylalanine and DOPamine, are being studied from the point of view of their mechanism, control and biosynthesis.

The Section on Alkaloid Biosynthesis studies the enzymes involved in alkaloid biosynthesis, their control and biosynthesis in relation to morphogenetic development of the plant; also, enzymatic mechanisms of transmethylation and intermediary metabolism of sulfur containing amino acids in various conditions.



THE LABORATORY OF NEUROCHEMISTRY SECTION ON PSYCHIATRY (Dan F. Bradley, Ph. D., Chief) conducts a program of research focusing on the structure and function of biological polymers. Studies in this general area are carried out using light absorption, fluorescence, optical rotatory dispersion, ultracentrifugation, viscosity, flow birefringence, and dichroism, X-ray diffraction, chromatography, fast reaction kinetics, quantum mechanical calculations, and digital computer techniques.

Current projects include studies on the dye-stacking theory of metachromasia, the molecular structure of antibodies, the anionic charge density in the squid axon membrane, the quantum mechanical theory of hypochromism in nucleic acids, and induced optical activity in helical biopolymer-dye complexes.

THE LABORATORY OF NEUROPHYSIOLOGY (Wade H. Marshall, Ph. D., Chief) conducts a program in basic neurophysiology on problems ranging from basic membrane mechanisms to brain and behavior. Current investigations include (1) Brain and behavior with particular emphasis on the limbic system; (2) physiology and biophysics of membrane; (3) physiology of spinal cord; and (4) general neurophysiology of the brain.

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## NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS

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Karl Frank, Ph. D., Acting Associate Director for Intramural Research  
Maitland Baldwin, M.D., Clinical Director

Descriptions of the NINDB program areas to which Associates will be appointed follow. For Clinical Associate appointments, preference is given to applicants who have completed at least 1 to 2 years of residency in either neurology, medicine, or ophthalmology.

THE MEDICAL NEUROLOGY BRANCH (W. King Engel, M.D., Chief) has as its major function the application of basic research techniques to the investigation of clinical neurological problems. The Clinical Associate during his tenure becomes acquainted with a majority of the neurological diseases, with particular emphasis on the disorders of muscle, myasthenia gravis, lower motor neuron diseases, metabolic abnormalities of the central nervous system, and genetically determined disorders. He receives instruction in clinical neurology and the related clinical and basic sciences while developing an understanding of the various laboratory techniques which support the neurological investigation. During the 12 months he is in a ward environment he is responsible for the care of patients on the Medical Neurology



Service and the integration of related research. The second year is spent applying one of a variety of basic laboratory techniques (such as histochemistry, tissue culture, biochemistry, immunology, or electromyography) to a clinical problem. The senior Clinical Associates participate in the consulting service.

**THE SURGICAL NEUROLOGY BRANCH** (Maitland Baldwin, M.D., Chief) is concerned with the investigation of epilepsy, involuntary movements, head injury, developmental disorders, brain tumor, cerebral edema, effects of surgical lesions on the nervous system, psychological assessment of surgical lesions, the application of anesthesia to neurological disease states, and problems of hypothermia as related to the nervous system.

The Clinical Associate is required to study and has responsibility for the care of patients with epilepsy, involuntary movements, brain tumors, vascular malformations of the nervous system, and others with a miscellany of neurological disease. He receives practice and instruction in clinical neurology, and, in particular, in the diagnostic techniques of surgical neurology and the operative techniques of neurological surgery as well as the principles on which these techniques are based. He attends clinical rounds in Medical Neurology, staff conferences in electroencephalography and X-ray diagnosis, as well as neuropathological conferences. He is advised to acquire as great a familiarity with the various laboratory techniques as is commensurate with his individual responsibilities and the commitments of the various laboratories in the NINDB.

**THE OPHTHALMOLOGY BRANCH** (Ludwig von Sallmann, M.D., Chief) has clinical programs with the following disease groups: Uveitis, glaucoma, retinal degenerations, vascular retinopathies, tumors of the eye, and cataract.

There are five laboratory sections: (1) Neurophysiology (Head, Dr. M. Fuortes)—fundamental investigations on the mechanism of vision and psychophysical studies; (2) Cell Biology (Head, Dr. S. Bonting)—studies on Na-K activated ATPase in relation to active transfer processes in biologic systems; (3) Pharmacology (Head, Dr. F. Macri)—studies on aqueous dynamics and intraocular pressure; on pressure and perfusate flow rates in intraocular vessels; (4) Histology and Cytology (Acting Head, Dr. L. von Sallmann)—cell population dynamics studies on eye tissue; (5) Collagen Chemistry (Head, Dr. M. Lewis)—physicochemical studies on collagen of the cornea, sclera, and vitreous body.

**THE ELECTROENCEPHALOGRAPHY BRANCH** (Cosimo Ajmone Marsan, M.D., Ph. D., Chief) involves a relatively small highly specialized patient population from the entire Clinical Center. One Clinical Associate position is available for a 1-year appointment (preference is given to people with basic neurological training). In neurophysiology one position (Research Asso-

ciate) is available. Appointment is for 2 years (preference is given to people with some previous experience in the field of electrophysiology and a knowledge of neuroanatomy). Current research: Experimental epilepsy, thalamo-cortical relationship, nature of brain waves, etc.

**LABORATORY OF NEUROCHEMISTRY** (Donald B. Tower, M.D., Ph. D., Chief) directs research toward the elucidation of the chemical attributes of neural tissues which underlie the normal functioning of the nervous system and the derangements of function in various neurological diseases. The investigations, which are primarily at the basic level, are distributed among four sections of the laboratory. The Lipid Chemistry Section, the Enzyme Chemistry Section, the Section on Amino Acids and Electrolytes, and the Physiology and Metabolism Section. In these investigations a wide variety of disciplinary approaches and methodologies, including appropriate clinical material, are being utilized. Special emphasis is given to the relevance of the various laboratory programs to neurophysiological problems, such as mechanisms subserving reception, conduction and transmission of nerve impulses, and to clinical problems, such as the bases for the lipodystrophies, demyelinating diseases, epilepsy, cerebral edema, and nutritional and genetically-determined disorders.

**THE LABORATORY OF MOLECULAR BIOLOGY** (Ernst Freese, Ph. D., Chief) examines chemical alterations of the hereditary material and control mechanisms of enzyme synthesis and function.

(1) Alterations of the hereditary material (DNA) can arise spontaneously or they can be induced by a variety of agents; the laboratory investigates the effect of several agents, such as hydroxylamine derivatives, as well as the induction of mutations by a particular virus. A molecular explanation of the biological phenomena is obtained by a correlation analysis between biological observations and specific chemical effects on isolated transforming DNA.

(2) Control mechanisms of enzyme synthesis and function are the basic elements of differentiation. These mechanisms can be analyzed at the biological level by determining which compounds inhibit, repress or induce specific enzymes, and they can be analyzed at the molecular level, e.g. by the frequency of different soluble RNA molecules at different stages of development. The particular systems being studied in detail are those of sporulation and germination of *Bacillus subtilis* and the control of dehydrogenase enzymes in this organism.

**THE LABORATORY OF NEUROPATHOLOGY** (Jan Cammermeyer, M.D., Chief) recognizes that an accurate appreciation of pathologic manifestations in microscopic structures is essential for an understanding of the underlying mechanism and exact diagnosis of diseases in the human central nervous

system. Primary emphasis is given to basic alteration of cellular morphology of properly prepared histologic material obtained under various experimental conditions, such as anoxia, fat emboli, peripheral nerve injury, and physical stress in animals of varying known age. Laboratory projects are conducted by both individuals and groups, and appropriate independent investigations are encouraged. Familiarity with general pathology is preferable for all staff members.

**THE LABORATORY OF NEUROPHYSIOLOGY** (Wade H. Marshall, Ph. D., Chief) conducts a program in basic neurophysiology on problems ranging from basic membrane mechanisms to brain and behavior. It has a Section on Spinal Cord currently headed by Phillip G. Nelson, M.D., Ph. D., of the National Institute of Neurological Diseases and Blindness; its other sections, however, come under the direct purview of the National Institute of Mental Health.

**LABORATORY OF NEUROANATOMICAL SCIENCES** (Alfred J. Coulombre, Ph. D., Chief) the concepts and methods of a number of disciplines including morphology, physiology, embryology, and biochemistry are used to explore the structure, composition and function of the sense organs, the nervous system and the effector organs. Although the specific problems under study reflect current interests and competencies of the staff, most of the major components of the sensory, nervous and motor systems are under active investigation each year in the four sections into which the laboratory is divided: The Section on Functional Neuroanatomy, the Section on Experimental Neurology, the Section on Neurocytology, and the Section on Experimental Embryology.

Candidates for research associate positions in this laboratory usually must have had research experience under the guidance of an established investigator.

### **The Collaborative and Field Program of NINDB**

**THE PERINATAL RESEARCH BRANCH'S SECTION ON INFECTIOUS DISEASES** (John L. Sever, M.D., Chief) (1) develops and utilizes large-scale serological methods to study the relation between viral, protozoal, bacterial infections, and birth defects and related abnormalities; (2) conducts investigations on viruses, protozoa, and bacteria, to produce antisera to these agents and to determine the effects of these microorganisms on the animals and fetal tissues; (3) investigates recovery of infectious agents and chromosome changes in fetal tissue specimens; (4) studies the effects of specially selected viruses on human volunteers and other populations to determine their pathogenicity.



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## DIVISION OF BIOLOGICS STANDARDS

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Roderick Murray, M.D., Director

The Division of Biologics Standards is accepting applications for Staff Associateships in its Laboratory of Viral Immunology. The laboratory gives preference to applicants with 1 or more years of residency training in pediatrics or medicine but does not require prior experience in virology. Appointments will become effective July 1, 1966 or July 1, 1967, depending on the ability of the laboratory to accept candidates at each time and on the candidates' desires for deferment.

THE LABORATORY OF VIRAL IMMUNOLOGY (Harry M. Meyer, Jr., M.D., Chief) is engaged in a program of virus research with special emphasis on the study of viruses of current or potential importance in the biologics field. Although the laboratory participates in clinical trials of vaccines on occasion, individuals should anticipate spending all or most of their time in laboratory research. Each Staff Associate works under the guidance of a senior member of the professional staff. Projects vary from basic to applied research, depending on the interests of the individual and the needs of the Division. Assignment to this Laboratory offers the opportunity to acquire a foundation in laboratory virology and for this reason would be most valuable to physicians planning an academic career in infectious diseases or a related field.

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## OFFICE OF INTERNATIONAL RESEARCH

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Charles L. Williams, Jr., M.D., Chief

Clifford A. Pease, M.D., Special Assistant for Scientific Affairs

This office, within the Office of the Director of NIH, operates an International Research Career Development Program, which is a broadening of the Associate programs to provide for assignment of approximately five of these Public Health Service Officers each year to research projects and programs overseas being carried out by the Public Health Service or which are of special interest to the Service.

Unusual or unique opportunities exist in foreign countries to pursue studies of substantial importance to medical science and to the health of Americans. Investigations in the field of geographic pathology and epidemiology on an international basis continue to provide important clues to the causes of certain diseases which cannot be studied adequately in our environment. The incidence, for example, of atherosclerosis and cancer, are substantially affected by hereditary and environmental factors, and the effect of these factors may be studied best in foreign countries. It has now

been shown that susceptibility to coronary artery disease is, in part, related to the nature of the diet, and was to a major degree confirmed by studies overseas in populations consuming diets substantially different from those of Americans. In the fields of infectious disease, nutrition, and genetics, many important discoveries of direct relevance to the health of the American people have been or could be made by exploiting unusual research opportunities in foreign lands.

A major objective of the International Research Career Development Program will be to attract talented investigators into careers in the Public Health Service. Therefore, in most instances IRCDP Associates will be assigned to U.S. Public Health Service Research installations or teams such as the NIH-NIMR Research Laboratory (Ghana), the NIH research team at the Pakistan-SEATO Cholera Research Laboratory at Dacca, East Pakistan, and the NIH Middle America Research Unit (MARU) in the Panama Canal Zone. Other U.S. Government research installations that may be considered include the Navy Medical Research Units in Egypt and Taiwan, and the Walter Reed Medical Research laboratories in Thailand and Japan. However, Associates may be assigned to foreign laboratories and projects of other Federal and private groups when they present special opportunities to extend specific research objectives of the U.S. Public Health Service.

While studies in infectious disease are particularly appropriate overseas, these research units abroad are carrying out and planning studies in a variety of disciplines. In addition, each of the institutes of the NIH has specific international programs and interests. For example, at the Pakistan-SEATO Cholera Research Laboratory in Pakistan scientists of the National Heart Institute are exploiting a unique opportunity for studying water and electrolyte depletion and repletion phenomena. Investigators in the National Institute of Arthritis and Metabolic Diseases are studying the epidemiology of diabetes in connection with nutrition surveys in foreign countries.

The term of service of the IRCDP Associate will be 2 years. Usually all or most of this term will be spent overseas in a particular overseas research laboratory or unit, but in certain cases, a period of orientation and/or training in the United States will be provided before the assignment abroad. This period can also include language training when appropriate.

Individuals with M.D., D.V.M., Ph. D., or D.D.S. degrees will be eligible, and, in general, some experience in research will be required. Only candidates with excellent academic records and strong recommendations will be considered. Fluency in a language other than English is desirable, but not required.

The Office of International Research will review the applications of the candidates and will recommend the most highly qualified of the applicants for Reserve Commissions in the U.S. Public Health Service. They will then review and assign priorities to research programs to which it is pro-



posed to assign IRCDP Associates. Assignments will be determined after consideration of the scientific quality and importance to the U.S. Public Health Service of the research programs proposed, the qualifications and interests of the Associate, and, particularly, the degree to which the research experience would be appropriate as a stage in a Public Health Service career. In each instance a senior investigator will assume responsibility for supervising and acting as preceptor for the Associate. Each Associate will be assigned to a NIH Institute to establish contacts for potential career development of appointees who successfully complete their initial 2-year period of service and wish to continue their research careers with an emphasis on international studies.

Letters requesting further information about the IRCD program should be addressed to the Office of International Research, National Institutes of Health, Bethesda, Md., 20014.

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### CLINICAL CENTER

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Jack Masur, M.D., Director

C. K. Himmelsbach, M.D., Associate Director

Robert M. Farrier, M.D., Assistant Director (Professional Services Departments)

At the time of their appointment to the Clinical Center's Anesthesiology and Diagnostic X-ray Departments, Staff Associates shall have completed their basic residencies in Anesthesiology and Radiology respectively. Since the completion of their residencies in these specialties clearly defines their





career interests, applicants for these positions will be selected directly by the department chiefs without recourse to the matching of candidate and program-area preferences (as indicated in Part Two of this publication).

THE ANESTHESIOLOGY DEPARTMENT (Clarence L. Hebert, M.D., Chief) offers advanced training—through the Associate program—to medical graduates who have fulfilled residency requirements of the American Board of Anesthesiology, and who have special interest in research. (Senior residents from other hospitals are accepted for brief periods for special training. Arrangements for such assignments must be made well in advance by the director of the residency program.)

The Anesthesiology Department is organized as a central service to provide anesthesiological care for all patients hospitalized at the Clinical Center, NIH. Inhalation therapy and consultative services for special problems (respiratory, pain, etc.) are included.

Four of the National Institutes of Health have surgical services which have active programs in surgical research.

The National Cancer Institute (Surgery Branch) has a long-range program concerned with the performance of extensive radical surgery with special emphasis on the treatment of patients with malignancy of pelvic organs and structures of the head and neck. In addition, various types of other general surgery are done on NCI patients and those patients sponsored by other Institutes, who require surgery during their Clinical Center stay.

The National Heart Institute admits patients for the study and treatment of congenital and acquired heart disease. All types of cardiac surgery are performed, the majority consisting of open heart operations performed with the aid of extracorporeal circulation. Six or more of these operations are done weekly.

The National Institute of Neurological Diseases and Blindness has several surgical programs including: Ophthalmological surgery; localization and surgical removal of epileptogenic foci within the temporal lobe for the treatment of epilepsy; stereotaxic procedures for the relief of syndromes characterized by abnormal movements and rigidity; and the removal of malignant lesions of the brain with the aid of generalized hypothermia.

The NINDB sponsors a neuroanesthesia laboratory with a full-time research anesthesiologist. Large primate animals are utilized in some of the studies.

The National Institute of Dental Research sponsors a project for the detailed study of physiological variables in ambulatory dental patients undergoing oral surgery under general anesthesia. Various anesthetic agents and techniques are employed in the study.

The clinical workload is relatively light, with the number of anesthetics averaging about 140 per month. Ample time is available for anesthesiologists who wish to spend time in laboratory investigational work. At least 1 day per week is allotted for laboratory work and additional time is usually available. The animal laboratory facilities of the NHI and the NINDB are

available to our staff. Advice and assistance from senior investigators, including outside consultants are available.

An Anesthesia Research Laboratory is operated as a joint project by the Surgery Branch of the National Heart Institute and the Anesthesiology Department of the Clinical Center.

The Anesthesiology Department staff is comprised of eight full-time anesthesiologists, three nurse anesthetists, three anesthesia technicians, four inhalation therapists, three extracorporeal apparatus technicians, and two secretaries. A visiting anesthesiologist from a foreign country may also be on the staff.

THE DIAGNOSTIC X-RAY DEPARTMENT (Betty E. Hathaway, M.D., Chief) offers a 1-year program of advanced training in special study procedures for medical graduates who have completed an internship and an approved 3-year residency in radiology.

The 1-year program of advanced training is in the area of special study procedures which include: Angiocardiology; femoral arteriography; celiac and renal arteriography, selective; inferior venocavography; lymphangiography; carotid and vertebral arteriography; pneumoencephalography and ventriculography; retroperitoneal air studies and gynecography; and radioactive isotope studies of the brain, heart, liver, thyroid, kidneys, spleen, and lungs.

The Diagnostic Radiology Department of the Clinical Center provides the diagnostic X-ray and radioisotope services for all of the patients from seven institutes. The clinical material studied radiographically is most unusual and many opportunities are available for intramural research programs with the physicians and scientists from the institutes.

Approximately 40,000 X-ray examinations are performed annually on 25,000 patients. The radiographic equipment is excellent. Close liaison is maintained with the radiation therapy department as well as with the radiology departments of local hospitals.



#### PART FOUR

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### Academic

## Programs Available to Associates

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Included among the academic programs to which an NIH Associate may avail himself while working at the Institutes' Bethesda, Md., location are: Evening courses provided by the Foundation for Advanced Education in the Sciences, Inc.; formal Seminars under the direction of NIH staff; Combined Clinical Staff Conferences; and formal Lectures.

#### Evening Courses

Accredited evening courses are provided by the Graduate Program of the Foundation for Advanced Education in the Sciences, Inc. Established by scientists who subscribe to the view that learning research, and teaching are mutually reinforcing processes essential to the evolution of science, the Foundation is a non-Federal independent organization under the Government Employees Training Act, however, its tuition and other fees can be paid by a Federal employer. Courses are offered in two semesters, fall and spring; courses are offered at the undergraduate, and graduate levels under the programs of its several Departments of instruction: Behavioral and social



sciences, biochemistry, chemistry, genetics, mathematics and physics, medicine and physiology, microbiology and immunology, languages, and general studies. Further inquiries regarding the Graduate Program and requests for its current catalog should be directed to: Registrar, Foundation for Advanced Education in the Sciences, Inc., National Institutes of Health, Bethesda, Md., 20014.

### Seminars

An NIH program of formal tutorial seminars and informal discussion groups is designed in content and emphasis for prospective independent investigators, and giving them the additional opportunity to master selected topics not adequately covered during college or graduate schooling. This program, which is headed by Dr. C. B. Anfinsen, has been developed by a Scientific Advisory Committee consisting of Drs. Robert W. Berliner, C. B. Anfinsen, Kenneth S. Cole, Hewitt G. Fletcher, Jr., Robert B. Livingston, J. Edward Rall, David Shakow, Herbert A. Sober, Daniel Steinberg, C. Gordon Zubrod, Alan H. Mehler, Seymour S. Kety, Roger M. Cole, and Robert A. Cohen.

These exercises are an integral part of the Research Associate program and are geared specifically in that direction. The program also accommodates a selected number of Clinical Associates and other properly qualified persons. To maintain the quality of instruction, and the intensity of individual identification with the program, a series of "divisions" has been established. Each of these deals with one of the major subdivisions of research in the life sciences and is under the immediate direction of individuals who perform the required interviewing and arrange for seminar leaders. These divisions include:

- (1) Biochemistry, genetics and immunology (General direction: Dr. C. B. Anfinsen and Dr. J. Potts). Seminars available include biochemistry (spring and fall); molecular biology, immunochemistry (2 seminars, spring). This area also utilizes certain outstanding courses in the NIH graduate program, such as theoretical organic chemistry, which are best taught by lecturing rather than through small seminar discussion groups.
- (2) Neural and behaviorial sciences (General direction: Dr. S. S. Kety and Dr. R. A. Cohen). Seminars include: Biological mechanism in behavior; neurochemistry; neurophysiology; neuropharmacology; functional neuroanatomy; developmental psychology and biology; psychosocial processes in behavior; cognitive processes; patterns of family interactions; cross-cultural studies.
- (3) Physical biology and related exact sciences (General direction: Dr. Mones Berman and Dr. Harold Edelhoch). Seminars include: Calculus; mathematical kinetics; mathematics of regulation; probability and stochastic processes; computers and their applications in biology; radiation biology; theoretical neurophysiology, photobiology, physical chemistry, reaction kinetics; thermodynamics and statistical mechanics; amino acids,

polypeptides and proteins; nucleotides, polynucleotides, and nucleic acids, macromolecules, spectroscopy.

(4) Cell biology and physiology (General direction: Dr. C. G. Zubrod and Dr. D. P. Rall). Seminars include: Mammalian genetics; genetics and differentiation of somatic cells; behavior of cells in tissue culture; nucleotide metabolism in mammalian cells; physiology and pharmacology of biological membranes; physiology of the endocrines; reproductive physiology; cytogenetics and chromosomal aberrations; structure and function of intracellular particulates; biological control mechanisms.

Upon arrival at the NIH, an Associate joins the division of his choice. Usually, he will participate in seminars in several of the divisions during his tenure at NIH although occasionally all of his didactic needs will be fulfilled within a single division. Seminars run from September through January and from February through June. They are of 2- to 3-hours' duration, and the participants present specific material under the direction of a qualified expert in the field. In preparation for these, the Associate does appropriate outside reading. Further background material is gained through attendance at weekly "divisional meetings." At these, invited guests present reviews of their current research interests, opportunities for informal discussion are abundant, and the Associate may "try out" a lecture on his own research work. An evening supper club composed of the Associates in that division, their preceptors and a few outside guests may also be organized.

#### **Combined Clinical Staff Conferences and Lectureships**

Aside from the rounds and staff conferences within the separate institutes engaged in clinical research, the Clinical Center sponsors at least one monthly Combined Clinical Staff Conference for 9 months of the year, with no meetings being held during June, July, and August. Each conference is conducted by one of the Institute services or an appropriate Department of the Clinical Center. This series of conferences is complemented by Grand Rounds and Clinical Pathological Conferences which, in effect, serve the same purpose. The conferences—open to the entire clinical staff and those engaged in laboratory research as well—center around clinical case material having interest for a large portion of the staff; and serve to keep individual investigators abreast of current emphasis in all clinical research.

Ordinarily, four formal lectures are given annually at the Clinical Center. Three of these are National Institutes of Health Lectures established in 1953 to recognize outstanding scientific accomplishment and to contribute to the vital interchange of scientific information. The lectureships are awarded by the Director of NIH on the advice of the Scientific Directors of the Institutes. The R. E. Dyer Lectureship was established in 1950 by friends and colleagues of Dr. Rolla E. Dyer, Director of the National Institutes of Health, 1942-50, to pay him tribute upon the occasion of his re-

tirement from the Public Health Service. The award is made at appropriate times—usually on an annual basis—to a scientist who has made an outstanding contribution to knowledge in a field of medical science; and is administered by NIH.

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## Addendum—Residencies

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Fully approved residency programs are offered in clinical pathology, anatomical pathology, combined clinical and anatomical pathology, and oral pathology. Requests for information and application forms regarding these programs should be addressed to the respective program chiefs:

George Z. Williams, M.D.  
Chief, Clinical Pathology Department  
Clinical Center  
National Institutes of Health  
Bethesda, Maryland 20014

Harold L. Stewart, M.D.  
Chief, Pathological Anatomy  
Clinical Center  
National Institutes of Health  
Bethesda, Maryland 20014

Harold R. Stanley, D.D.S.  
Chief of Oral Medicine and Surgery  
National Institute of Dental Research  
National Institutes of Health  
Bethesda, Maryland 20014

On the basis of agreements between program chiefs and appropriate American Speciality Boards, Clinical Associates in dermatology, psychiatry, and neurology may receive credit for one, 1, and 2 years respectively. Associates in internal medicine who remain at NIH for a third year may receive credit for this year upon application to the American Board of Internal Medicine.





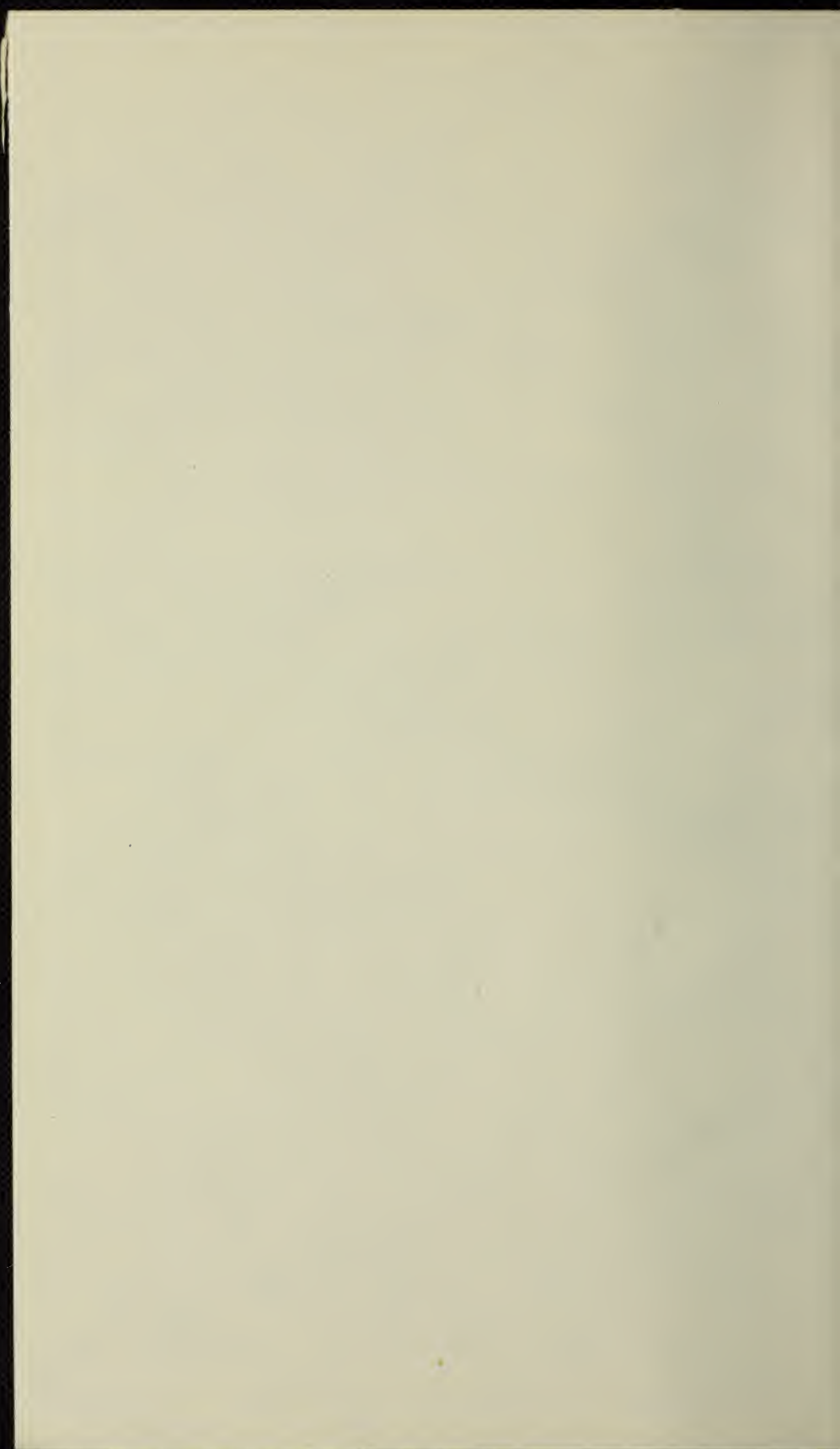
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